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seen in eggs of turtles, rabbits, squirrels, &c. The eggs of Mammals are very minute, and surrounded by epithelium; and they begin at once their subdivision within the parent. In those of birds, a large bulk of vitellus is developed in the ovary, and afterwards the albumen and shell are added. The same is the case in turtles, lizards, and serpents; but the eggs of Batrachians are different, and are small, elastic, and dilatable, like those of fishes. He thought, therefore, that there was a closer affinity between the first-mentioned reptiles and birds than between them and the Batrachians; and that the turtles, lizards, and serpents might be incorporated with birds, while the Batrachians were classed with fishes.

Professor Horsford exhibited several specimens of vermilion which varied very essentially in color from adulteration. Some of the articles used for that purpose are chromate of lead, sulphate of lime, and carbonate of magnesia.

Mr. Desor mentioned some facts relating to the distribution of animals in the region of Lake Superior, and specified some of the animals found on Isle Royale, whose presence he was at a loss to account for, except on the supposition that the island was once continuous with the continent.

Three hundred and twenty-sixth meeting.

January 8, 1850. — MONTHLY MEETING.

The PRESIDENT in the chair.

Dr. C. T. Jackson, from the committee raised at a former meeting to suggest a practicable mode for recording by coast-marks the present mean sea-level on the Atlantic shore of this country, made a report, in the form of a memorial to the Secretary of the Treasury. The draft was recommitted, in order that a proper resolution, expressing the sense of the Academy, might be appended.

Mr. Paine presented a communication from Professor Augustus W. Smith, of Middletown, Connecticut, containing

Occultations of Fixed Stars, &c., at the Wesleyan University, Middletown, Connecticut. Latitude, 41° 33′ 10″. *Assumed Longitude,* $4^{h.}\ 50^{m.}\ 36^{s.}$.

Date.	Name.	Sidereal Time.				
1845.		h.	m.	s.		
April 15	A² Cancri	9	27	01.38	Im.	Good observation.
May 9	62 Orionis	11	26	45.55	“	“ “
“ 9	Unknown	11	24	23.50	“	2s. (?)
“ 9	“	12	20	16.40	“	1s. (?)
July 16	58 Sagittarii	17	03	39.92	“	Good observation.
“ 17	29 “	17	45	33.95	“	Pretty good observation.
Sept. 12	ν Piscium	1	44	49.92	“	“ “ “
“ 15	λ “	18	40	36.09	“	1s. (?)
“ 15	λ “	19	29	50.00	Em.	1s. (?)
Nov. 10	δ “	20	54	04.48	Im.	Pretty good.
1846.						
Feb. 4	74 Tauri	3	56	21.11	“	1s. (?)
“ 6	71 Orionis	6	06	41.87	“	Pretty good.
May 3	2 Leonis	11	29	43.35	“	“ “
1847.						
Jan. 25	61 Tauri	5	00	56.61	“	“ “
Sept. 16	Unknown	18	51	18.33	“	“ “
“ 16	29 Ophiuchi	19	03	50.83	“	“ “
1848.						
Feb. 12	α Tauri	2	22	30.08	“	*
“ 16	29 Cancri	7	02	50.55	“	Pretty good.
Mar. 8	750 B. A. C.	6	05	41.19	“	“ “
“ 10	75 Tauri	8	30	29.26	“	“ “
“ 10	Unknown	8	21	02.26	“	“ “
“ 11	111 Tauri	7	23	21.40	“	“ “
“ 11	Unknown	7	20	31.40	“	“ “
“ 13	λ Geminorum	7	35	41.90	“	“ “
“ 16	3,398 B.A.C.(?)	9	05	01.19	“	“ “
May 6	26 Geminorum	11	33	42.08	“	Saw a bright spot in the dark part of the [Moon.
“ 6	“	11	52	44.00	Em.	1s. (?)
June 6	3,418 B. A. C.	13	43	53.86	Im.	
Nov. 8	Mercury	14	53	39	Em.	2d internal contact with Sun’s limb.
“ 8	“	14	55	19	“	2d external “ “ “ “
“ 11	54 Tauri	21	59	40.60	Im.	Good observation.
1849.						
Jan. 5	75 “	3	35	44.80	“	“ “
“ 5	1,391 B. A. C.	4	46	12.20	“	Thin clouds. Observation fair.
“ 5	α Tauri	7	36	35.70	“	“ “ “ good.
“ 5	α “	8	42	27.70	Em.	Recognized the star by its form, not by its brightness. Appeared projected on the disk slightly.
“ 6	111 “	0	22	18.20	Im.	
Feb. 7	31 Leonis	7	05	31.27	“	Pretty good.
Mar. 1	1,517 B. A. C.	8	32	02.40	“	1s. (?)
April 6	38 Virginis	10	29	27.04	“	Pretty good.
June 25	21,678 Lalande	13	25	54.85	“	“ “
July 22	59 Leonis	15	48	17.50	“	“ “
Oct. 24	7,263 B. A. C.	23	47	11.72	“	“ “

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* This observation was supposed to be good at the time, and no error can be found by referring to the original entry in my book of rough records. But a reduction of the observation for this longitude leads to the supposition that it ought to be $2^{h.}\ 20^{m.}\ 30.08^{s.}$.

Professor Lovering read the following communication, viz.: —

" *Remarks on the Aneroid Barometer*, *by* PROFESSOR J. LOVERING, *of Harvard University.*

" Most of the scientific journals of Europe and America have published descriptions of the new French barometer, as it is called. For the construction of the instrument, and the history of its invention, I may refer to them; and particularly to that contained in *Silliman's Journal* for September, 1849.

" The two ordinary statical ways of measuring forces are, first, by means of gravity, and, second, by means of elasticity. Our common balances to measure weight employ, either the gravity of a known counterpoise, or the elasticity of a spring. In like manner, the weight of a column of the atmosphere is determined by ascertaining the height of a similar column of some known fluid, which it is able to support, or the elasticity of some familiar substance with which it is in equilibrium. The barometer with which we are most familiar employs the first method: the aneroid barometer, which, as its name implies, contains no liquid, is based on the last principle, namely, that of measuring weight by elasticity.

" This new instrument is already manufactured, in large numbers, in France and Great Britain; and its adoption is recommended on the ground of economy, as well as of its great compactness. The barometer is now extensively used, not only for tracing out the grand laws of meteorology, but also as a practical guide to the mariner to forewarn him of approaching storms, and an indispensable auxiliary to the man of science in studying the geography of the solid parts of our planet. It is highly important that the meteorologist, the navigator, and the student of general science, should know what degree of accuracy may be claimed for the new barometer, and to what extent they are allowed to trust themselves to its indications. With the hope of assisting those who desire to form an opinion on this subject, I present the following experiments and observations, undertaken originally at the suggestion of Professor A. D. Bache, Superintendent of the United States Coast Survey. The instrument employed in this research was furnished by Professor Bache. It bears the number 1265, and came from the establishment of Lerebours and Secretan, Paris.

"A series of experiments was first made with this aneroid barometer, to determine the whole range of the instrument. It was placed for this purpose, first under the receiver of a common air-pump, and afterwards under the receiver of a condensing pump. In this way, it was found capable of indicating a change of atmospheric pressure, which would move the column of mercury in an ordinary barometer from about twenty inches up to about thirty-one inches. From the nature of its construction, the index is incapable of moving beyond the point which corresponds to twenty inches of the mercurial barometer, or beyond that which corresponds to thirty-one inches of the same. How accurately its march between these limits agrees with that of the mercurial barometer will appear from an examination of Table I. The pressure of the air in the receiver of the pump was derived from the pump-gage, which was supplied with common mercury, and corrected for level and capillarity. This table shows that, while the index of the aneroid barometer continues to move, it moves farther than the column of mercury. As it approaches its lower limit, it will begin, of course, to move more slowly, and afterwards the differences between its indications and those of the mercury change sign. It is obvious that, in this instrument at least, and with large ranges, similar changes of pressure are not marked by equal quantities of motion in the index, in all parts of the scale. This might be expected in an instrument where no consideration is given to the distinction between the potential and the apparent leverage. Besides this error, which we may call the instrumental error, there appears to be an irregularity in the motion of the index, arising from friction, bending, or some other cause, which would interfere seriously with the accuracy of this barometer, even if the arc over which the index moves were so graduated as to indicate the true pressure.

"At the meeting of the British Association, in 1848, it was stated by Mr. Lloyd, that one of his friends had made a similar experiment to that I have described, and that the indications of the aneroid barometer agreed with those of the pump-gage to within .01 of an inch. Such is the statement in the *London Athenæum*, although no mention is made of the subject in the Report of the Association for that year. As we are not informed to what amount of diminished pressure the aneroid barometer was subjected in this case, and whether the difference above mentioned was the result of a single observation or the mean of many, I am not able to say how far my own experiments are at variance with those to which Mr. Lloyd refers. Neither am I able to say how much of the error manifested by my comparisons is fairly to be charged to the general character of the new barometer, and how much is peculiar to the single instrument with which I experimented. I intend, as soon as an opportunity offers, to subject other specimens of the aneroid barometer, both of French and English construction, to the same trial.

" My next series of experiments consisted in a comparison of the aneroid barometer, day by day, with the common barometer, under the ordinary changes of atmospheric pressure. The mercurial barometer used for this purpose was made by W. and S. Jones, of London, and is the same as that used by Professor Farrar in the barometric observations published by him in Volume III. of the Memoirs of this Academy. This instrument is furnished with an adjustment for level, an attached thermometer, and a scale of corrections for temperature. This correction, as well as that for capillarity, has been applied to my observations. In this series of experiments it was necessary to know how much the aneroid barometer was affected by a change of temperature. Only a partial compensation is aimed at in the construction of the instrument. An increase of temperature will make the air in the reservoir expand, in the same way as a diminution of pressure. The same increase of temperature, by enlarging the metallic surfaces of the reservoir and increasing its capacity, may sometimes even over-compensate for the increased elasticity of the contained gas. In the instrument which I used, the compensation was deficient, and the amount of the deficiency was determined by exposing the barometer, side by side with a thermometer, to a temperature of 32° Fah., and reading the index, and then exposing it to a high temperature (in some instances as high as 140° Fah.), and then again reading the index. The difference of the two readings divided by the difference of the two temperatures was adopted as the correction for one degree, and was applied to the daily observations. The value of this correction, as obtained from the mean of five experiments, was .0021 of an inch, with the same sign as in the mercurial barometer. To accommodate the scale of the mercurial barometer, the standard temperature adopted was 55° Fah. The aneroid barometer which I used was not provided (as is sometimes the case) with an attached thermometer. A thermometer by the side of it, and not under the same inclosure as the air-chest, does not indicate the exact temperature of the working parts of the instrument. The slowness with which the index returned to its old mark after the barometer had been subjected to excessive heat or cold, and was then restored to the temperature of the room, manifests the importance of having the thermometer inclosed as the test of the instrument. The result of this series of comparisons is given in Table II. Although the agreement is much better than with low ranges, it falls far below the requirements of nice scientific investigations.

"Mr. David Purdie Thompson, in his very recent work on Meteorology, has the following paragraph: — 'Upon comparison of indications made with the aneroid barometer — not corrected for the particular temperature — and a very perfect mercurial barometer, given by Mr. Dent, we find that, from forty-nine observations made between the 6th of January and the 23d of February, 1848, the mean difference was 0.037 of an inch, the *aneroid* being in excess; and from sixty similar observations made with a standard barometer, during December, 1848, and between the 3d and 31st of January, 1849, the mean difference amounted to 0.026 of an inch, the *mercurial* being in this case in excess over the aneroid barometer. Combining these observations (109 in number), a mean difference amounting to 0.0025 inch is found to exist, the indications of the aneroid being in excess. For general use, the instrument is thus shown to be well suited; for the measurement of heights, it is peculiarly adapted, from its portability and comparative strength; and for nautical purposes we know of no better instrument.' — p. 448.

"Now it will be observed that the mean difference in the twenty-eight comparisons which I have given of the two barometers amounts to only 0.040 of an inch. So far as can be known from such means, the comparison was as satisfactory as in the first set given by Mr. Thompson. Still, the differences in single comparisons are large: whether larger or smaller than in Mr. Dent's observations, I am not able to say, as Mr. Thompson has not given the individual differences. Provision has been made in the construction of the instrument for diminishing the mean difference, as we may alter the rate of the chronometer. This mean difference has been eliminated from my comparisons, and the differences which are given in the last column manifest, by the signs of plus and minus, the irregularities of the instrument, and the error to be expected from these irregularities in single observations. I have arranged the same observations in Table III. according to the sign and the value of the differences. From the sign of the differences it appears that, when the barometers fall, the aneroid falls most, and when the barometers rise, the aneroid rises most. In other words, the aneroid index, moving either way from the place where it agrees with the reading of the mercurial barometer, moves too fast. The experiments with the air-pump indicate the same tendency more unequivocally. For, in those experiments, where the two barometers were moving in a direction which corresponds to a depression of the common barometer, the aneroid always moved the most, so that when the motion of the mercury in the pump-gage is subtracted from the motion of the aneroid index, the sign is always plus; at least, until we approach the lower limit of range. Although this is the general character of the differences, a nice examination of the observations shows that here, as well as in the experiments with the air-pump, there are errors and fluctuations which cannot be traced to any law of the instrument, and against which no provision can be made. Table IV. contains a series of observations made with the view of ascertaining the stability of the levers in the aneroid barometer, and the firmness of other parts of the instrument. The instrument was first read off; and then, after being exposed to diminished pressure, it was noticed with what fidelity and despatch the index returned to its original position when the original pressure was restored.

"It must not be forgotten that it is single observations, indicating momentary changes of atmospheric pressure, on which the navigator most relies. In some of the hurricanes to which he is exposed, the barometer occasionally sinks so low as to come within the range of those experiments made with the air-pump. And yet here, if anywhere, the aneroid barometer finds its appropriate sphere. In meteorology, the barometer is the most important instrument of research. The barometer alone, of all the instruments employed in this research, is independent of merely local changes, and gages the atmosphere to its upper limit. But the range of atmospheric pressure is so limited, that laborious series of observations, with the nicest barometers that can be constructed, are necessary in order to develop the harmonies of nature. No observer would be willing to risk the value of this long labor by trusting to the new barometer, until its peculiarities are better understood than at present. It may possibly happen, that a long series of observations which eliminates irregularities of weather will eliminate instrumental irregularities at the same time. The same objection applies with greater force to the application of the aneroid barometer to the measurement of heights above the level of the sea. An elevation of eighty-seven feet depresses the barometer by about .1 of an inch only ; hence, a small error in the barometer will entail a large error on the estimated elevation. Moreover, a long series of observations in this case will generally be impracticable. I would make one farther remark in this connection. The mercurial barometer is liable to be broken when exposed to the perils of mountain travel. In this case the damage, though great, is known and appreciated, and no error is introduced into science. Unless the barometer is broken, it is so simple in its construction that it is not likely to be injured at all. It is otherwise with the aneroid barometer. To appearance it is stronger, and can bear a greater strain without being broken. On the other hand, we can easily foresee that it may be materially injured without attracting the notice of the observer at the time, and in this way may conceal its own infirmities under its apparent strength. It should be added, in justice to the aneroid barometer, that it is far from having been carried as yet to that degree of perfection in its mechanical execution which the principle on which it is based will allow. When it shall have received, at the hands of the artist, that amount of skill and delicacy in its construction which is expended on the chronometer, a more impartial comparison can be made between its claims and those of the best mercurial barometers."

Table I.

1849.	Fall of the Aneroid Barometer under the Receiver.	Rise of the Mercury in the Pump-gage, corrected for Capillarity and Level.	Difference.	1849.	Fall of the Aneroid Barometer under the Receiver.	Rise of the Mercury in the Pump-gage, corrected for Capillarity and Level.	Difference.
Sept. 24,	4.27	4.258	.012+	Sept. 27,	10.42	20.721	10.301—
Thermometer not observed. Barometer, 29.760.	7.78	7.673	.107+	Thermometer, 66. Barometer, 29.940.	10.40	19.338	8.938—
	10.10	15.830	5.730—		10.38	18.236	7.856—
	10.07	16.030	5.960—		10.38	17.294	6.914—
	9.78	10.150	.370—		10.36	16.282	5.922—
	9.44	9.268	.172+		10.30	15.030	4.730—
	8.46	8.216	.244+		10.02	10.140	.120—
	7.52	7.264	.256+		9.60	9.268	.332+
	6.48	6.232	.248+		8.68	8.246	.434+
	5.48	5.240	.240+		7.72	7.224	.496+
	4.45	4.388	.062+		6.79	6.332	.458+
	3.38	3.256	.124+		5.61	5.270	.340+
	2.32	2.214	.106+		4.49	4.208	.282+
					3.50	3.256	.244+
Sept. 26,	10.13	18.537	8.407—		2.36	2.254	.106+
Thermometer, 72.5. Barometer, 29.690.	10.11	17.294	7.184—				
	10.11	16.382	6.272—	Sept. 29,	10.63	23.035	12.405—
	10.07	15.280	5.210—	Thermometer, 66.5. Barometer, 30.170.	10.59	16.262	5.672—
	9.75	10.220	.470—		10.23	10.220	.010+
	9.36	9.268	.092+		9.75	9.328	.422+
	8.71	8.316	.394+		9.02	8.426	.594+
	7.67	7.274	.396+		7.95	7.294	.656+
	6.67	6.262	.408+		6.93	6.332	.598+
	5.53	5.120	.410+		5.80	5.270	.530+
	4.67	4.238	.432+		4.63	4.238	.392+
	3.34	3.206	.134+		2.45	2.224	.226+
	2.30	2.154	.146+				

Dec. 4. The aneroid barometer was placed under the receiver of a condensing-pump, when it was observed that it would only move up to thirty-one inches (corresponding to thirty-one inches of a common barometer).

TABLE II.

1849.	Aneroid, corrected for Temperature.	Mercurial, corrected for Level, Capillarity, and Temperature.	Difference.	Difference after eliminating Mean Difference of Instruments.
Dec. 10,	29.932	29.977	.045—	.005—
11,	30.089	30.107	.018—	.022+
12,	30.439	30.507	.068—	.028—
13,	30.267	30.237	.030+	.070+
14,	30.122	30.117	.005+	.045+
15,	30.378	30.397	.019—	.021+
16,	30.148	30.147	.001+	.041+
17,	29.870	29.907	.037—	.003+
18,	30.327	30.327	.000	.040+
19,	30.519	30.537	.018—	.022+
20,	29.703	29.787	.084—	.044—
21,	30.119	30.127	.008—	.032+
22,	30.012	30.067	.055—	.015—
23,	29.353	29.447	.094—	.054—
24,	29.595	29.667	.072—	.032—
25,	29.488	29.597	.109—	.069—
26,	30.212	30.310	.098—	.058—
27,	30.087	30.160	.073—	.033—
28,	30.407	30.447	.040—	.000
29,	30.025	30.090	.065—	.025—
30,	30.200	30.197	.003+	.043+
31,	30.115	30.147	.032—	.008+
1850.				
Jan. 2,	30.360	30.407	.047—	.007—
3,	30.156	30.207	.051—	.011—
4,	29.890	29.937	.047—	.007—
5,	30.125	30.137	.012—	.028+
6,	30.464	30.517	.053—	.013—
7,	30.340	30.367	.027—	.013+
Mean,	30.098	30.138 30.098		
	Difference,	.040—		

TABLE III.

Observations in Table II., *arranged according to the Amount and the Sign of the Differences.*

29.597	.069—	30.237	.070+
30.310	.058—	30.117	.045+
29.447	.054—	30.197	.043+
29.787	.044—	30.147	.041+
30.160	.033—	30.327	.040+
29.667	,032—	30.127	.032+
30.507	.028—	30.137	.028+
30.090	.025—	30.537	.022+
30.067	.015—	30.107	.022+
30.517	.013—	30.397	.021+
30.207	.011—	30.367	.013+
30.407	.007—	30.147	.008+
29.937	.007—	29.907	.003+
29.977	.005—	Mean, 30.212	.029+
Mean, 30.048	.029—	" 30.048	
		Difference, .164	

TABLE IV.

1849, Sept. 10. The aneroid stood at 30.39. It was placed under the receiver of an air-pump, and the atmospheric pressure diminished by five inches. When the air was admitted, the index moved forward to 30.35. It rose to 30.375 in two or three minutes. The following table embraces similar experiments, with their results.

1849.	Original Reading of the Aneroid Barometer.	Reading after the Air was admitted.	Difference.	Degree of Rarefaction as measured by the Pump-gage.
Sept. 10,	30.390	30.375	.015—	5 inches.
	30.480	30.530	.050+	5 "
	30.375	30.360	.015—	5 "
	30.360	30.460	.100+	9 "
	30.480	30.500	.020+	5 "
	30.530	30.530	.000	9 "
Sept. 24,	29.760	29.720	.040—	16 "
26,	29.690	29.680	.010—	18 "
27,	29.940	29.930	.010—	20 "
29,	30.170	30.050	.120—	22 "

Dr. C. T. Jackson exhibited some specimens of native copper, and gave a verbal account of some of the evidences of ancient Indian mining at Lake Superior. Dr. A. A. Hayes stated that the occasion of these samples being on the table was a proper one for him to take, in communicating the fact,

"that, from extended observations, embracing more than five hundred specimens of the Lake Superior native copper, no instance occurred in which the slightest indication was presented of this copper having been fused in its present condition. I have investigated its internal structure, by a new method of analysis, which permits all alloys and foreign matters to fall on one side, while the pure copper is separated and weighed as such on the other. In this way, and by little modifications, the highly crystallized structure is exposed to view, the less regularly polarized portions being removed. Whether we subject the solid thick masses, or the thinnest plates, to the operation, one constant result is obtained; — *that this copper has taken its present varied forms of crystallized masses, more or less flattened, laminated, or grooved, by the movements among the parts, composing the rocks in which it is found.* If we select a mass which has entered a cavity, we find the crystals with their angles sharp and uninjured, while the mass mainly may have been compressed into a plate. Dissecting this, the crystals are seen to be connected with and form parts of the original system of crystallization. Flattened and grooved specimens often present on their edges arrow-head-shaped forms, derived from regular crystals, crushed and laminated."

Dr. Hayes, having alluded to a new method, a kind of proximate analysis of metals and alloys, further stated, that it is one which admits of almost universal application. Operating on irons of commerce, he has demonstrated that phosphorus and sulphur, usually found to be present, are not united to the iron, but with more highly electro-positive metals, such as potassium, sodium, and calcium, the latter most commonly. And in all alloys thus far examined, the compound is a metal in a pure homogeneous state, while one, two, or three definite alloys are distributed, often unequally, throughout the mass. In some tough metals, brittle substances like iron ores, quartz, &c., are found, rendering the method of research one of great interest and importance.

Dr. Hayes called the attention of the Fellows to the fact, that

" The urinary deposition called red sand, which presents such well-defined crystals, is a compound body, having generally a large quantity of oxalate of lime crystallized with it. Crystals of various forms and colors were shown under the microscope. Lithic acid, ammonia, coloring matter, and oxalate of lime are the most common and obvious ingredients assuming a crystalline form. Oxalate of lime, as inferred from more than twenty-five analyses of different urine samples, is always present, and may be detected both by spreading a layer of aqua ammonia on the surface of recent urine, when the salt crystallizes, and by adding hydrochlorate of lime to recent urine, washing the precipitate and subsequent analysis. Recent healthy urine is always acid; but this state is not produced by carbonic acid, united to the phosphates, as has been supposed. When salts of lead, lime, baryta, or magnesia are added, the acidity is preserved unchanged. The carbonic acid usually present is disengaged by a powerful acid, with the effervescence due to its gaseous form, but, independently of this, there exists an acid reaction. It has been assumed that oxalic acid is absent in cases where no crystals of oxalate of lime separated from samples of urine preserved. If the acid action is very marked, such cases are no exceptions, for in *urine* we do not expect unfailing chemical decompositions of salts. Besides, it can be shown that, even in alkaline urines, oxalate of lime separates as red sand, and covers the surface after several days of exposure for deposition. These, with other observations, lead to the conclusion, that we are far from possessing a true knowledge of the composition of this important secretion. A true analysis can only be made by operating on recent urine, by precipitations and evaporations, without loss of time and aid of heat; the more important constituents are otherwise converted into secondary products of the steps of the analysis."

Professor Horsford read a paper from Mr. Breed of the Lawrence Scientific School, giving an account of a series of experiments on the nature of vesication, and showing that the process was totally independent of evaporation.

Professor Horsford also exhibited a Daguerreotype of the moon, taken in front of the eye-glass of a telescope, by Mr. Wells of the Scientific School.